

REMARKS

Claims 1-46 were pending when the present Office Action was mailed (September 22, 2008), with claims 3, 7, 8, 12, 13, 17, 18, 22, 24, 25, 28, 31, 35, 36, 40, 45, and 46 withdrawn from consideration. Accordingly, claims 1, 2, 4-6, 9-11, 14-16, 19-21, 23, 26, 27, 29, 30, 32-34, 37-39, 41-44 are currently pending.

In the September 22, 2008 Office Action, claims 1, 2, 4, 9, 10, 14, 15, 19-21, 26, 27, 29, 30, 32, 33, 37-39, and 41-43 were rejected. The Examiner objected to claims 5, 6, 11, 16, 23, 34, and 44 for depending from a rejected base claim. More specifically, the status of the application in light of this Office Action is as follows:

(A) Claims 1, 2, 9, 14, 26, 27, 29, and 30 were rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 5,658,503 to Johnston et al. ("Johnston");

(B) Claim 19 was rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 6,199,465 to Hattori ("Hattori");

(C) Claim 29 was rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 6,387,324 to Patterson et al. ("Patterson");

(D) Claims 32 and 37-39 were rejected under 35 U.S.C. § 103(a) over the combination of Johnston and the Background Information;

(E) Claim 42 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Hattori and the Background Information;

(F) Claims 4, 10, 15, and 19-21 were rejected under 35 U.S.C. § 103(a) over the combination of Johnston and Hattori;

(G) Claims 33, 41, and 43 were rejected under 35 U.S.C. § 103(a) over the combination of Johnston, the Background Information, and Hattori; and

(H) Claims 5, 6, 11, 16, 23, 34, and 44 were objected to as depending from rejected base claims.

A. Response to the Section 102(b) Rejection over Johnston

Claims 1, 2, 9, 14, 26, 27, 29, and 30 were rejected under 35 U.S.C. § 102(b) over Johnston. As discussed below, this rejection should be withdrawn because the cited reference does not teach or suggest all the claimed features.

1. Claim 1 is Directed to an Ampoule that Includes, *Inter Alia*, a Conduit in a Vessel, the Conduit Having a First Portion in a Precursor Region, a Second Portion in a Headspace, an Opening in the First Portion Positioned to be in the Precursor Region, and an Outlet in the Second Portion Positioned to be in the Headspace

Claim 1 is directed to an ampoule for producing a reaction gas for processing a microfeature workpiece in a reaction chamber. The ampoule includes, among other things, a vessel including an interior volume having a precursor region configured to receive a precursor and a headspace above the precursor region. The ampoule also includes a conduit in the vessel. The conduit has a first portion in the precursor region, a second portion in the headspace, an opening in the first portion positioned to be in the precursor, and an outlet in the second portion positioned to be in the headspace. The ampoule further includes a flow driver for flowing precursor through the conduit and into the headspace to increase the surface area of the precursor exposed to a carrier gas.

2. Johnston Discloses a Device for Mixing Two Fluids, One a Liquid, the Other a Gas

Johnston discloses a mixing device that provides uniform distribution of gas and liquid to parallel channels (Johnston, Abstract). The device includes a vessel having side walls 3, bottom 5, and top 7 (column 3, line 19). A gas inlet 9 communicates with the interior of the vessel through a plenum chamber 11 having a top plate 13 which extends from each side wall 3. The gas chamber is designed to provide a uniform flow of gas to tubes 15 (column 3, lines 23-25). Gas passes upwardly through tubes 15 and mixes with liquid entering via apertures 25 situated in tubes 15 (column 3, lines 52-53).

The tubes 15 pass completely through chamber 19, continue completely through a "shell" feature of the heat exchanger, and terminate in chamber 109 (Figures 1 and 2). The top 7 is

imperforate with the exception of openings for passage of tubes 15 into the exchanger (column 3, line 66-column 4, line 1). Also, the mixed phase of fluids passing through tubes 15 exits into a collection space 109 which does not communicate with the shellside fluid that is being cooled or heated in the exchanger (column 4, lines 7-12).

3. Johnston Fails to Disclose or Suggest All the claimed Aspects of Independent Claim 1

Claim 1 is patentable because Johnston fails to disclose or suggest all the claimed aspects of independent claim 1. For example, Johnston fails to disclose a conduit having a first portion in a precursor region of a vessel, and a second portion having an outlet positioned in a headspace of the vessel. The Office Action suggests that element 109 of Johnston is a headspace. Applicant respectfully disagrees. Element 109 is structurally different than Applicant's claimed headspace because, for example, element 109 is not positioned above the precursor in the headspace, as claimed in independent claim 1. Johnston explicitly states, "top 7 is imperforate with the exception of openings for passage of tubes 15 into the exchanger," and "the mixed phase of fluids passing through tubes 15 do not communicate with the shellside fluid." (Johnston, column 3, lines 66-67, column 4, lines 7-12.) The outlet of tubes 15 is not positioned to be in a headspace above the precursor. Several embodiments are shown in Applicant's figures 4-8A, showing a headspace 178 above the precursor 170 region, and an opening 168 in a conduit 164 positioned to be in the headspace 178. Because Johnston does not disclose or suggest, for example, an outlet portion positioned to be in the headspace, Johnston does not disclose or suggest all the claimed elements of independent claim 1. Therefore, the rejection of claim 1 should be withdrawn for at least this reason.

Claim 1 is further patentable because Johnston's disclosed heat exchanger is incapable of increasing the vaporization rate in the manner of claim 1. Claim 1 recites "to increase the surface area of the precursor exposed to a carrier gas." Applicant's claimed ampoule includes at least two openings: one underneath the level of the precursor 170, and another in the headspace 178. The precursor exits the headspace 178 at the outlet 168, and thereby increases the vaporization rate of the precursor fluid because the exposed surface area is greater than the transverse cross-sectional

area of the vessel. Johnston's heat exchanger is incapable of increasing the vaporization rate of the fluid in the tubes in this way, because there is no opening in the headspace. Since Johnston's tubes 15 do not contain an opening in a headspace, Johnston cannot achieve this increased vaporization rate in this way. Johnston fails to disclose at least this claimed aspect of claim 1.

Claim 1 is also patentable because Johnston does not disclose an ampoule for producing a reaction gas for processing a microfeature workpiece in a reaction chamber, as recited in claim 1. Applicant notes the Examiner's comment in the Office Action of September 22, 2008, that the materials worked on by a known apparatus or the intended use of a known apparatus cannot be considered to lend patentable weight to the apparatus claims. Johnston's heat exchanger and Applicant's ampoule as set forth in claim 1, however, are structurally distinct. Johnson, for example, lacks a headspace positioned to be above the precursor, and an opening positioned to be in the headspace. The different purposes and fluids of the two devices are evidence of this distinct structure. Applicant discloses the precursor comprises fluids such as halides, THDs and DMHDs, or other low vapor pressure liquids or even solids. In contrast, the heat exchangers disclosed by Johnston commonly use water or refrigerant as the liquid, and air as the gas. These materials have different material properties, pose different difficulties, and are used for completely different purposes. For this reason, Johnston does not disclose or suggest an opening in the headspace, because increasing vaporization in the manner claimed by Applicant is not performed by Johnston's device. For at least the foregoing reasons, claim 1 is patentable over Johnston. Accordingly, the Section 102 rejection of independent claim 1 should be withdrawn.

Independent claims 9, 14, 26, and 29 include features generally analogous to the features of claim 1. Accordingly, the Section 102 rejection of claims 9, 14, 26, and 29 should be withdrawn for at least the reasons discussed above with reference to claim 1, and for the additional features of these claims.

Claims 2, 27, and 30 depend from independent claims 1, 26, and 29, respectively. Accordingly, the Section 102 rejection of dependent claims 2, 27, and 30 should be withdrawn for at least the reasons discussed above with reference to independent claims 1, 26, and 29, and for the additional features of these dependent claims.

B. Response to the Section 102(b) Rejection over Hattori

Claim 19 was rejected under 35 U.S.C. § 102(b) over Hattori. As discussed below, this rejection should be withdrawn because the cited reference does not teach or suggest all the claimed features.

1. Claim 19 is Directed to An Ampoule for Producing a Reaction Gas, Including a Conduit for Conveying a Flow of Precursor to a Headspace, and a Precursor Exposure Assembly at Least Partially Within the Headspace and Positioned so that At Least Some of the Nonvaporized Precursor Flows From the Conduit Onto the Precursor Exposure Assembly

Claim 19 is directed to an ampoule for producing a reaction gas for processing a microfeature workpiece in a reaction chamber. The ampoule includes, *inter alia*, a vessel having an interior volume configured to receive a precursor with a headspace above the precursor. The ampoule further includes a conduit for conveying a flow of precursor to the headspace, and a carrier gas inlet for flowing carrier gas into the vessel. The ampoule also comprises a precursor exposure assembly at least partially within the headspace and positioned so that at least some of the nonvaporized precursor flows from the conduit onto the precursor exposure assembly to increase the surface area of the precursor exposed to the carrier gas.

2. Hattori Discloses a Liquid Coater that Applies Liquid to Target Objects by Delivering Mists in a Container

Hattori discloses an oil mist dispenser for use with a cutting tool, such as a lathe or a grinding machine (Hattori, column 1, lines 7-9). In Hattori's Example 3, an oil feeder is shown in which an upper nozzle 66 and a lower nozzle 65 inject gas from tube 69 into a container 64 (Figures 6 and 7). The nozzles 65 and 66 are arranged to provide a spiral fluid motion, as depicted in Figures 7, 8A, and 8B. A mist-conveying pipe 67 removes oil mist from the container for use with the cutting tool.

3. Hattori Fails to Disclose or Suggest All the claimed Aspects of Independent Claim 19

Claim 19 is patentable over Hattori because Hattori fails to disclose or suggest all the claimed features of claim 19. For example, Hattori fails to disclose a conduit for conveying a flow

of precursor to the headspace. In Hattori, oil is added to the container through a liquid injection port cap 68 (Hattori, column 11, line 50). However, this cap is closed during operation (as shown in Figure 7) and therefore does not convey a flow of precursor to the headspace. Upper and lower nozzles 66 and 65, respectively, also do not carry a flow of precursor to a headspace: they are connected to the same tube 69 to carry gas (Figure 6; column 9, lines 40-41).

Claim 19 is further patentable because Hattori fails to disclose a precursor exposure assembly at least partially within a headspace and positioned so that at least some of the nonvaporized precursor flows from the conduit onto the precursor exposure assembly to increase the surface area of the precursor exposed to the carrier gas. To the contrary, Hattori's Figure 7 shows a container with nothing that can be called a precursor exposure assembly. Hattori's Figure 5 discloses a partition 23, but this partition is not configured to increase the surface area of exposed precursor. The partition 23 creates the opposite effect: it shields the oil below from the mist above. Hattori describes the operation of the partition as: "Since the liquid surface is not disturbed in the liquid reservoir, mists with a stable mist-particle size can be conveyed." (column 2, lines 58-67.) Hattori also states that the mists are formed above the partition 23, while the reservoir is held below the partition 23 (column 7, lines 22-28).

Because Hattori fails to disclose or suggest, for example, a precursor exposure assembly at least partially within the headspace as recited in claim 19, Hattori fails to disclose or suggest all the claimed features. Accordingly, the Section 102 rejection of independent claim 19 should be withdrawn for at least this reason.

C. Response to the Section 102(b) Rejection over Patterson

Claim 29 was rejected under 35 U.S.C. § 102(b) as being anticipated by Patterson. As discussed below, this rejection should be withdrawn because Patterson does not teach or suggest all the claimed features.

1. Claim 29 is Directed to an Ampoule for Producing a Reaction Gas for Processing a Microfeature Workpiece in a Reaction Chamber, the Ampoule Includes, Inter Alia, a Flow Driver for Flowing Precursor Through the Conduit and Into the Headspace to Increase the Surface Area of the Precursor Exposed to a Carrier Gas

Claim 29 is directed to an ampoule for producing a reaction gas for processing a microfeature workpiece in a reaction chamber. The ampoule includes a vessel having an interior volume configured to receive a precursor with a headspace above the precursor, and a conduit for conveying a flow of the precursor into the headspace. The ampoule also includes a flow driver for flowing precursor through the conduit and into the headspace to increase the surface area of the precursor exposed to a carrier gas.

2. Patterson Discloses a System and Method for Oxygenating Blood

Patterson discloses an apparatus including a chamber 300 coupled to a regulated source of oxygen gas 310. A nozzle 320 issues atomized saline solution into the chamber 300. At the bottom of the chamber 300, fluid collects to form a pool 360 which advantageously includes fluid having a dissolved gas. The fluid is removed from the chamber 300 for delivery to a given location (Patterson, Figure 10; column 20, lines 29-60).

3. Patterson Fails to Disclose or Suggest All the Claimed Features of Independent Claim 29

Claim 29 is patentable over Patterson because Patterson fails to disclose or suggest all the claimed features of claim 29. For example, Patterson does not disclose or suggest vaporizing precursor into a carrier gas; rather, Patterson infuses a gas into a liquid. Patterson's blood oxygenating device dissolves oxygen into saline, allows the saline to pool at the bottom of the chamber, and then pumps the oxygen-rich saline fluid out of the bottom of the chamber (Patterson, column 20, lines 52-60). Patterson's disclosed device is not structurally configured to use a gas as a carrier gas. In contrast, Applicant's carrier gas is driven through the precursor, and is taken from above the headspace 178 through line 140 to the reaction chamber 110 while the carrier gas contains vaporized precursor. For at least the foregoing reasons, Patterson does not disclose or suggest all the claimed features of claim 29. Accordingly, the Section 102 rejection of claim 29 should be withdrawn.

D. Response to the Section 103(a) Rejection over the combination of Johnston and the Background Information

Claims 32 and 37-39 were rejected under 35 U.S.C. § 103(a) over the combination of Johnston and the Background Information. However, independent claims 32 and 37 include features generally analogous to the features of independent claim 1. Johnston cannot support a Section 102 rejection of base claims 32 and 37 for at least the reasons discussed above with reference to claim 1. Furthermore, the Background Information fails to cure the deficiencies of Johnston with respect to claims 32 and 37. Accordingly, the Section 103 rejection of claims 32 and 37 should be withdrawn for at least the reasons discussed above with reference to claim 1, and for the additional features of these claims.

Claims 38 and 39 depend from independent claim 37. Accordingly, the Section 103 rejection of claims 38 and 39 should be withdrawn for at least the reasons discussed above with reference to claim 37, and for the additional features of these claims.

E. Response to the Section 103(a) Rejection over the combination of Hattori and the Background Information

Claim 42 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hattori in combination with the Background Information. However, independent claim 42 contains features generally analogous to features of independent claim 1. Hattori cannot support a Section 102 rejection of base claim 42 for at least the reasons discussed above with reference to claim 1. Furthermore, the Background Information fails to cure the deficiencies of Hattori with respect to claim 42. Accordingly, the Section 103 rejection of claim 42 should be withdrawn for at least the reasons discussed above with reference to independent claim 1 and for the additional features of this claim.

F. Response to the Section 103(a) Rejection over the combination of Johnston and Hattori

Claims 4, 10, 15, and 19-21 were rejected under 35 U.S.C. § 103(a) over the combination of Johnston and Hattori. Regarding claims 4, 10, and 15, these claims depend from independent claims 1, 9, and 14, respectively. Hattori fails to cure the deficiencies of Johnston with respect to independent claims 1, 9, and 14. For example, as discussed in more detail above, neither

reference discloses or suggests, for example, a precursor exposure assembly onto which precursor flows to increase the surface area of the precursor exposed to a carrier gas. Also, neither reference discloses a conduit for conveying a flow of precursor to a headspace. Therefore, Hattori fails to cure Johnston's deficiencies with respect to independent claims 1, 9, and 14. Accordingly, the Section 103 rejection of claims 4, 10, and 15, should be withdrawn.

Claim 19 is also patentable over both Johnston and Hattori, alone or in combination. With respect to Johnston, claim 19 includes features generally analogous to features of independent claim 1. As discussed in detail above, Hattori fails to cure the deficiencies of Johnston with respect to independent claim 1. Accordingly, claim 19 is patentable over Johnston for at least the reasons discussed above with reference to independent claim 1, and for the additional features of this claim. Accordingly, the Section 103 rejection of claim 19 over the combination of Johnston and Hattori should be withdrawn.

Claims 20 and 21 depend from independent claim 19. Accordingly, the Section 103 rejection of dependent claims 20 and 21 should be withdrawn for at least the reasons discussed above with reference to claim 19, and for the additional features of these claims.

The Section 103 rejections should be withdrawn for the additional reason that the cited references are non-analogous art. Johnston is directed to heat exchangers, while Hattori is directed to an oil mist applicator. A person of ordinary skill in the art would never combine these two references from such disparate fields of endeavor to arrive at an ampoule for producing a reaction gas for processing a microfeature workpiece in a reaction chamber. The fluids carried by Johnston, Hattori, and Applicant (water or refrigerant, oil, and halides or THDs, respectively) have such different fluid properties, and are used for such different purposes (shell-and-tube heat exchanger, tool lubrication, and microfeature workpiece manufacture, respectively) that one of ordinary skill would never combine the teachings of Johnston and Hattori to arrive at Applicant's claimed ampoule. Accordingly, the Section 103 rejections over the combination of Johnston and Hattori should be withdrawn.

G. Response to the Section 103(a) Rejection over the combination of Johnston, the Background Information, and Hattori

Claims 33, 41, and 43 were rejected under 35 U.S.C. § 103(a) over the combination of Johnston, the Background Information, and Hattori. However, claims 33, 41, and 43 depend from independent claims 32, 37, and 42, respectively, and independent claims 32, 37, and 42 include features generally analogous to the features of independent claim 1. As discussed above, Johnston cannot support a Section 102 rejection of base claims 32, 37, and 42 for at least the reasons discussed above with reference to claim 1. Furthermore, Hattori and the Background Information, alone or in combination, fail to cure the deficiencies of Johnston with respect to independent claims 1, 32, 37, and 42. Accordingly, the Section 103 rejection of claims 33, 41, and 43 should be withdrawn for at least the reasons discussed above with reference to claim 1, and for the additional features of these claims.

H. Response to Claim Objections

Claims 5, 6, 11, 16, 23, 34, and 44 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form to include the features of the claim from which they depend and any intervening claims. Applicant thanks the Examiner for indicating that these claims are allowable.

I. Conclusion

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the applied art. The Applicants accordingly request reconsideration of the application and a Notice of Allowance. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to contact David Groesbeck at (206) 359-8065.

Respectfully submitted,

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